CHAPTER 4

Node Line Card Interface Configuration

The plug-and-play mechanisms of the Cisco 6400 allow it to come up automatically. All configuration information for node line cards (NLCs) can be saved between hot swaps and switch reboots, while interface types are automatically discovered by the switch, eliminating mandatory manual configuration.

This chapter describes how to manually configure ATM interfaces for the Cisco 6400 NLC, as opposed to using Interim Local Management Interface (ILMI) autoconfiguration (which senses the peer interface type and appropriately configures the system interfaces).

The network configuration modifications described in this chapter are used to explicitly specify your ATM network operation. Although the Cisco 6400 defaults to a working configuration suitable for most networks, you might need to customize the configuration for your network.

This chapter contains the following sections:

NLC Interface Identification

In the Cisco 6400, NLC interface addresses specify the physical location of each port on the system. The address is composed of a three-part number in the format slot/subslot/port:

- Slot—Identifies the chassis slot in which the card is installed. Card slots are numbered 1 to 8 from left to right when facing the front of the chassis.
- Subslot—Identifies the top or bottom half of a card slot. Sublots are numbered 0 to1 from top to bottom. Full-height NLCs are always identified with subslot 0.
- Port—Identifies the physical port number on the card. Port numbers always begin at 0 and are numbered from top to bottom.

Interfaces maintain the same address, even while other cards are installed in or removed from the chassis. If, however, you move an NLC to a different slot or subslot, the address changes to reflect the new slot and subslot.

Autoconfiguration

Enabled by default, autoconfiguration determines the interface type each time an interface initially comes up. To manually configure an NLC interface, you must disable autoconfiguration.

Disabling Autoconfiguration

Autoconfiguration is enabled by default, but can be disabled to manually configure an NLC interface.

To disable autoconfiguration on an interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Selects the NLC interface.
Step 2	`Switch(config-if)# no atm auto-configuration`	Disables autoconfiguration on the interface.

Example

In the following example, autoconfiguration is disabled on the interface ATM 1/0/0:

```
!
interface atm 1/0/0
  no atm auto-configuration
!
```

Default NLC Interface Configuration

When autoconfiguration is disabled, the NLC interface assumes the default configuration shown in Table 4-1.

Table 4-1 Default Configuration for Node Line Cards

Configuration Parameter	OC-3 Default	OC-12 Default	DS3 Default
ATM interface type	UNI	UNI	UNI
UNI version	3.0	3.0	3.0
Maximum VPI bits	8	8	8
Maximum VCI bits	14	14	14
ATM interface side	network	network	network
ATM UNI type	private	private	private
Clock source	network-derived	network-derived	network-derived
Framing	sts-3c	sts-12c	cbit-adm
Cell payload scrambling	on	on	off
Synchronous Transport Signal (STS) stream scrambling	on	on	—
Line buildout	—	—	short
Auto-FERF (all)	—	—	on

Verifying Autoconfiguration

To check if autoconfiguration is enabled or disabled on an NLC interface, use the **show atm interface** EXEC command.

In the following example, autoconfiguration is disabled on the OC-3 ATM interface 1/0/0:

```
Switch# show atm interface atm 1/0/0

Interface:      ATM1/0/0        Port-type:    oc3suni
IF Status:      UP              Admin Status: up
Auto-config:    disabled        AutoCfgState: not applicable
IF-Side:        Network         IF-type:      NNI
Uni-type:       not applicable  Uni-version:  not applicable
Max-VPI-bits:   8               Max-VCI-bits: 14
Max-VP:         255             Max-VC:       16383
Svc Upc Intent: pass            Signalling:   Enabled
ATM Address for Soft VC: 47.0091.8100.0000.0040.0b0a.2b81.4000.0c80.8000.00
Configured virtual links:
  PVCLs SoftVCLs   SVCLs   PVPLs SoftVPLs   SVPLs  Total-Cfgd  Installed-Conns
      3        0       0       0        0       0           3                3
Logical ports(VP-tunnels):     0
Input cells:    234663          Output cells: 235483
5 minute input rate:             0 bits/sec,       0 cells/sec
5 minute output rate:            0 bits/sec,       0 cells/sec
Input AAL5 pkts: 153211, Output AAL5 pkts: 153626, AAL5 crc errors: 0

Switch#
```

ATM Interface Types

This section describes how to configure NLC interfaces of the following types:

- User-Network Interfaces, page 4-3
- Network-to-Network Interfaces, page 4-5
- Interim Interswitch Signaling Protocol Interfaces, page 4-6

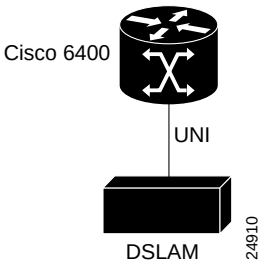
Note Whenever a change in the interface protocol (such as UNI, NNI, or IISP), side, or version is configured, ATM signaling and ILMI are restarted on the interface. When ATM signaling is restarted, all switched virtual connections (SVCs) across the interface are cleared; permanent virtual connections are not affected.

User-Network Interfaces

The User-Network Interface (UNI) specification defines communications between ATM-based products (a router or an ATM switch) located in a private network and the ATM switches located within the public carrier networks.

Figure 4-1 shows example UNIs configured between the Cisco 6400 and a digital subscriber line access multiplexer (DSLAM).

Figure 4-1 UNI Example



Note The UNI interface is the default for NLCs designed for the Cisco 6400. See Table 4-1 for the other parameters of the default NLC interface configuration.

Configuring UNIs

To manually configure an interface as UNI, complete the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Specifies the ATM interface and enters interface configuration mode.
Step 2	`Switch(config-if)# no atm auto-configuration`	Disables autoconfiguration on the interface.
Step 3	`Switch(config-if)# atm uni [side {private | public} type {network | user} version {3.0 | 3.1 | 4.0}]`	Configures the ATM UNI.
Step 4	`Switch(config-if)# atm maxvpi-bits bits`	(Optional) 0–8. Modifies the maximum VPI[1] bits configuration.
Step 5	`Switch(config-if)# atm maxvci-bits bits`	(Optional) 0–14. Modifies the maximum VCI[2] bits configuration.

1. VPI = virtual path identifier
2. VCI = virtual channel identifier

Example

In the following example, ATM 3/0/0 is configured as the private side of a UNI connection:

```
!
interface atm 3/0/0
  no atm auto-configuration
  atm uni side user type private version 4.0
  !
```

Verifying UNI Configuration

To verify UNI configuration for an ATM interface, use the **show atm interface** EXEC command:

```
Switch# show atm interface atm 3/0/0

Interface:      ATM0/1/0        Port-type:      oc3suni
IF Status:      UP              Admin Status:   up
Auto-config:    disabled        AutoCfgState:   not applicable
→ IF-Side:      Network         IF-type:        UNI


→ Uni-type:     private         Uni-version:    V3.0
...
```

Network-to-Network Interfaces

The Network-to-Network Interface (NNI) standard defines communication between two ATM switches that are both located in a private network or are both located in a public network. The interface between a public switch and private one is defined by the UNI standard.

Figure 4-2 shows example NNIs configured between two central office (CO) Cisco 6400 systems.

Figure 4-2 Private NNI Interface Example

Note You must configure private NNI connections between the ATM switches to allow for route discovery and topology analysis between the switches.

Configuring NNIs

To manually configure an interface as an NNI, complete the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Specifies an ATM interface and enters interface configuration mode.
Step 2	`Switch(config-if)# no atm auto-configuration`	Disables autoconfiguration on the interface.
Step 3	`Switch(config-if)# atm nni`	Configures the ATM NNI.
Step 4	`Switch(config-if)# atm maxvpi-bits` *bits*	(Optional) 0–8. Modifies the maximum VPI bits configuration.
Step 5	`Switch(config-if)# atm maxvci-bits` *bits*	(Optional) 0–14. Modifies the maximum VCI bits configuration.

Example

In the following example, ATM 3/0/0 is configured as an NNI:

```
!
interface atm 3/0/0
  no atm auto-configuration
  atm nni
  !
```

Verifying NNI Configuration

To verify NNI configuration for an ATM interface, use the **show atm interface** EXEC command:

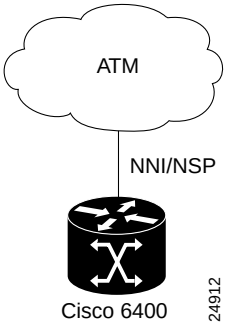
```
Switch# show atm interface atm 3/0/0

Interface:      ATM3/0/0        Port-type:    oc3suni
IF Status:      UP              Admin Status: up
Auto-config:    disabled        AutoCfgState: not applicable

→ IF-Side:        Network         IF-type:      NNI
  Uni-type:       not applicable  Uni-version:  not applicable

  ...
```

Interim Interswitch Signaling Protocol Interfaces

The Interim Interswitch Signalling Protocol (IISP) defines a static routing protocol (using manually configured prefix tables) for communication between ATM switches. IISP provides support for switched virtual circuits (SVCs) on ATM switches that do not support the Private Network-to-Network Interface (PNNI) protocol. For more information, see the "Configuring ATM Routing and PNNI" chapter in the *ATM Switch Router Software Configuration Guide*.

Figure 4-3 shows an example IISP interface that connects the Cisco 6400 to a switch in the ATM cloud.

Figure 4-3 IISP Interface Example



Configuring IISP Interfaces

To manually configure an IISP interface, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Specifies an ATM interface and enters interface configuration mode.
Step 2	`Switch(config-if)# no atm auto-configuration`	Disables autoconfiguration on the interface.
Step 3	`Switch(config-if)# atm iisp [side {network | user}] [version {3.0 | 3.1 | 4.0}]`	Configures the ATM IISP interface.
Step 4	`Switch(config-if)# atm maxvpi-bits bits`	(Optional) 0–8. Modifies the maximum VPI bits configuration.
Step 5	`Switch(config-if)# atm maxvci-bits bits`	(Optional) 0–14. Modifies the maximum VCI bits configuration.
Step 6	`Switch(config-if)# exit` `Switch(config)#`	Returns to global configuration mode.
Step 7	`Switch(config)# atm route prefix atm-address-prefix atm slot/subslot/port[.subinterface#]`	Configures an ATM route address prefix.

Example

In the following example, ATM 3/0/0 is configured as the user side of an IISP connection:

```
!
interface atm 3/0/0
  no atm auto-configuration
  atm iisp side user
  !
atm route 47.0091.8100.0000.0000.0ca7.ce01 atm 3/0/0
!
```

Verifying IISP Interface Configuration

To verify IISP interface configuration, use the **show atm interface** EXEC command:

```
Switch# show atm interface atm 3/0/0

Interface:      ATM3/0/0        Port-type:      oc3suni
IF Status:      UP              Admin Status:   up
Auto-config:    disabled        AutoCfgState:   not applicable


→ IF-Side:        User            IF-type:        IISP
  Uni-type:       not applicable  Uni-version:    V3.0
  Max-VPI-bits:   8               Max-VCI-bits:   14
  Max-VP:         255             Max-VC:         16383
  ConfMaxSvpcVpi: 255             CurrMaxSvpcVpi: 255
  ConfMaxSvccVpi: 255             CurrMaxSvccVpi: 255
  ConfMinSvccVci: 35              CurrMinSvccVci: 35
  Svc Upc Intent: pass            Signalling:     Enabled
  ATM Address for Soft VC: 47.0091.8100.0000.00e0.4fac.b401.4000.0c80.8000.00
  Configured virtual links:
    PVCLs SoftVCLs   SVCLs   TVCLs   PVPLs SoftVPLs   SVPLs Total-Cfgd Inst-Conns
        3        0       0       0       0        0       0          3          2
  Logical ports(VP-tunnels):     0
```

```
Input cells:    264089          Output cells:   273253
5 minute input rate:             0 bits/sec,       0 cells/sec
5 minute output rate:            0 bits/sec,       0 cells/sec
Input AAL5 pkts: 172421, Output AAL5 pkts: 176993, AAL5 crc errors: 0
```

NLC Interface Clocking

Each NLC port can be configured to support the following clocking options:

- Free-running—Transmit clock is derived from the local oscillator on the NLC port, with stratum level 4 accuracy.
- Loop-timed—Transmit clock is derived from the receive (rx) clock.
- Network-derived (default)—Transmit clock is derived from the port system clock specified at highest priority by the **network-clock-select** global configuration command.

For detailed information on network clocking, see the "Network Clocking" section on page 2-14.

Configuring the NLC Interface Clock

To select the transmit clock source for a port, complete the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Selects the interface to be configured.
Step 2	`Switch(config-if)# clock source {free-running | loop-timed | network-derived}`	Configures the interface network clock source.

Example

In the following example, ATM 4/0/0 is configured with a network-derived transmit clock source:

```
!
network-clock-select 1 atm 2/0/0
network-clock-select 2 atm 2/0/1
network-clock-select 3 atm 1/0/0
!
interface atm 4/0/0
→  clock source network-derived
   !
```

OC-3 NLC and OC-12 NLC Interface Options

The OC-3 NLC and OC-12 NLC support the following Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) framing modes:

- STM-1—Synchronous Transport Module level 1. One of a number of SDH formats that specifies the frame structure for the 155.52-Mbps lines used to carry ATM cells.
- STS-3c—Synchronous Transport Signal level 3, concatenated. SONET format that specifies the frame structure for the 155.52-Mbps lines used to carry ATM cells. (Default for OC-3 NLC.)
- STM-4—Synchronous Transport Module level 4. SDH/STM-4 operation (ITU-T specification).

- STS-12c—Synchronous Transport Signal level 12, concatenated (12 x 51.84 Mbps). SONET format that specifies the frame structure for the 5184-Mbps lines used to carry ATM cells. (Default for OC-12 NLC.)

The OC-3 NLC and OC-12 NLC support the following scrambling modes, both turned on by default:

- STS-stream—Scrambles the SONET/SDH Layer 1 stream
- Cell-payload—Scrambles only the payload of the cell (not the header)

Configuring the OC-3 and OC-12 Interface Options

To configure framing and scrambling on the OC-3 NLC and OC-12 NLC, complete the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Specifies an OC-3 or OC-12 ATM interface and enters interface configuration mode.
Step 2	`Switch(config-if)# sonet {stm-1 | sts-3c | stm-4 | sts-12c}`	Configures the SONET framing mode.
Step 3	`Switch(config-if)# [no] scrambling {cell-payload | sts-stream}`	Enables or disables the scrambling modes.

Example

In the following example, both cell-payload scrambling and STS-stream scrambling are disabled for the OC-3 interface ATM 1/0/0. Also, the SONET mode of operation is set to SDH/STM-1.

```
!
interface atm 1/0/0
  no scrambling cell-payload
  no scrambling sts-stream
  sonet sts-3c
  !
```

Verifying the OC-3 and OC-12 Interface Configuration

To verify successful configuration of OC-3 or OC-12 interfaces, use the **show controller atm** EXEC command. Check that the output displays the correct interface options.

```
Switch# show controller atm 7/0/0
Redundancy NOT Enabled on interface
IF Name: ATM7/0/0    Chip Base Address(es): A8B08000, 0 Port type: OC3    Port rate: 155
Mbps    Port medium: SM Fiber
Port status:Good Signal    Loopback:None    Flags:8308
TX Led: Traffic Pattern    RX Led: Traffic Pattern  TX clock source:  network-derived
Framing mode:  sts-3c
Cell payload scrambling on
Sts-stream scrambling on

...
```

DS3 NLC Interface Options

The DS3 NLC supports the following framing modes:

- cbitadm—C-bit with ATM direct mapping (default framing mode)
- cbitplcp—C-bit with physical layer convergence procedure (PLCP) framing
- m23adm—M23 ATM direct mapping
- m23plcp—M23 with PLCP framing

The DS3 NLC supports the cell payload scrambling mode, which scrambles only the payload of the cell (not the header). Cell payload scrambling is turned off by default.

The DS3 NLC defaults to a short line buildout, which supports cables less than 50 feet long. If the cable attached to the DS3 interface is longer than 50 feet, you must configure the long line buildout.

The DS3 NLC automatic far-end receive failure (FERF) alarms support the following values, all turned on by default:

- los—Loss of signal
- oof—Out of frame
- red—Indicates a major alarm
- ais—Alarm indication signal
- lcd—Loss of cell delineation

Configuring the DS3 Interface Options

To manually change any of the default configuration values, complete the following steps, beginning in global configuration mode:

	Command	Purpose
Step 1	`Switch(config)# interface atm slot/subslot/port`	Specifies an ATM interface and enters interface configuration mode.
Step 2	`Switch(config-if)# framing {cbitadm | cbitplcp | m23adm | m23plcp}`	Modifies the framing mode.
Step 3	`Switch(config-if)# [no] scambling cell-payload`	Enables or disables the scrambling mode.
Step 4	`Switch(config-if)# lbo {long | short}`	Modifies the line buildout.
Step 5	`Switch(config-if)# [no] auto-ferf {ais | lcd | los | oof | red}`	Modifies the automatic FERF configuration.

Example

In the following example, the DS3 interface ATM 3/0/0 is configured for C-bit with the ATM direct mapping framing mode and a short line buildout.

```
!
interface atm 3/0/0
  framing cbitadm
  lbo short
  !
```

Verifying the DS3 Interface Configurations

To verify successful configuration of DS3 interfaces, use the **show controllers atm** EXEC command. Check that the output displays the interface options you configured.

```
Switch# show controllers atm 1/1/0
IF Name:ATM1/1/0, Chip Base Address:A8C08000
Port type:DS3    Port rate:45000 Kbps    Port medium:Coax
Port status:Good Signal    Loopback:None    Flags:8108
TX Led:Traffic Pattern    RX Led:Traffic Pattern  TX clock source:
network-derived
DS3 Framing Mode: cbit plcp
FERF on AIS is on
FERF on LCD is on (n/a in PLCP mode)
FERF on RED is on
FERF on OOF is on
FERF on LOS is on
LBO:<= 225'
Cell payload scrambling on
...
```

Troubleshooting the NLC Interface Configuration

Table 4-2 describes commands that you can use to confirm proper configuration of the hardware, software, and interfaces for the Cisco 6400. Unless otherwise specified, all of the commands can be used in EXEC mode.

For more information on these commands, see the *ATM and Layer 3 Switch Router Command Reference*.

Table 4-2 NLC Interface Troubleshooting Commands

Command	Purpose
show version	Displays the version and type of software installed on the NSP.
show hardware	Displays the type of hardware installed in the Cisco 6400 system.
show atm addresses	Displays the ATM addresses configured in the system.
show atm interface	Displays ATM-specific information about an ATM interface.
show atm status	Displays current information about ATM interfaces and the number of installed connections.
show atm vc	Displays the ATM layer connection information about the virtual connections.
show controller atm	Displays information about the physical ATM port device.
more system:running-config	Displays the running configuration.
more nvram:startup-config	Displays the startup configuration.
ping atm interface atm	(Privileged EXEC command) Tests connectivity between the NSP and a host.